

A Compact, Low Power Pulsed Optical Communication System for Spacecraft

Completed Technology Project (2014 - 2017)



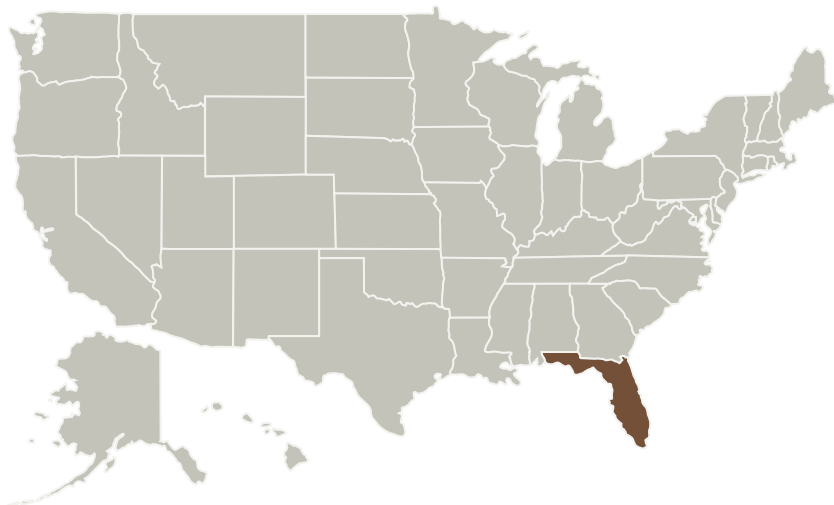
Project Introduction

The goal of this project is to reduce the power required for high bandwidth, deep space laser communications systems. Our concept will encode data in the time delay between short pulses of light. This technique, known as Differential Pulse-Position Modulation (DPPM), requires a low average power if the amount of data encoded in each delay is large, because each generated laser pulse then signifies a large number of bits. We will use a high precision clock to divide time into very small intervals (~ 0.1 nanoseconds), which will allow us to maintain high data rates (10-100 Mbits/second). We will demonstrate this technique in the lab and package it into a miniature optical communications instrument, designed for small spacecraft or any spacecraft where the mass and power are very constrained. The DPPM modulation scheme will be driven by a low power, space grade FPGA-based modem with time provided by a chip-scale atomic clock. The FPGA modulator will drive a pulsed laser system in a Master Oscillator Power Fiber Amplifier configuration that will emit energetic pulses of 1550 nm laser light. The instrument will be designed from the ground up to be adaptable to a wide range of communications and power requirements and efficient so that it can be demonstrated in space on a low-cost nanosatellite in the future.

Anticipated Benefits

The goal of this project is to reduce the power required for high bandwidth, deep space laser communications systems.

Primary U.S. Work Locations and Key Partners



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Table of Contents

Project Introduction	1
Anticipated Benefits	1
Primary U.S. Work Locations and Key Partners	1
Project Website:	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Technology Areas	3
Target Destinations	3

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Organizations Performing Work	Role	Type	Location
University of Florida	Lead Organization	Academia	Gainesville, Florida

Primary U.S. Work Locations

Florida

Project Website:

<https://www.nasa.gov/directorates/spacetech/home/index.html>

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

University of Florida

Responsible Program:

Space Technology Research Grants

Project Management

Program Director:

Claudia M Meyer

Program Manager:

Hung D Nguyen

Principal Investigator:

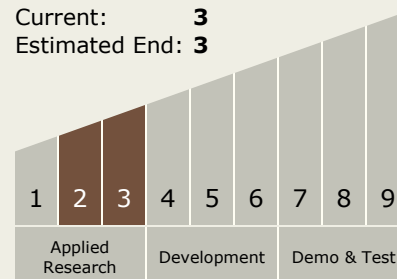
John W Conklin

Technology Maturity (TRL)

Start: 2

Current: 3

Estimated End: 3



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Technology Areas

Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
 - └ TX05.1 Optical Communications
 - └ TX05.1.7 Innovative Signal Modulations

Target Destinations

Mars, Others Inside the Solar System